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EXAMINER
MITCHELL, JASON D

ART UNIT	PAPER NUMBER
2193	

DATE MAILED: 11/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/044,731	**Applicant(s)** PRAKASH, RAJ
	Examiner Jason Mitchell	**Art Unit** 2193

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2005*.

2a)☒ This action is **FINAL**. 2b)□ This action is non-final.

3)□ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 33-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)□ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 33-48* is/are rejected.

7)□ Claim(s) _____ is/are objected to.

8)□ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)□ The specification is objected to by the Examiner.

10)□ The drawing(s) filed on _____ is/are: a)□ accepted or b)□ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)□ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)□ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)□ All b)□ Some * c)□ None of:

1.□ Certified copies of the priority documents have been received.

2.□ Certified copies of the priority documents have been received in Application No. _____.

3.□ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) □ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) □ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4) □ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) □ Notice of Informal Patent Application (PTO-152)

6) □ Other: _____.

DETAILED ACTION

This action is in response to remarks filed on 9/6/05.

At Applicant's request claims 1-2 and 44-45 have been amended. Claims 1-8 and 33-48 are pending in this application.

Response to Arguments

As pointed out by Applicant in the first paragraph on pg. 7 the inclusion of claims 9, 11, 13, 15, 17, 19, 20 and 23 in the heading listing the claims rejected over Schilling in view of Kawahito and further in view of Benitez, was erroneous. This mistake has been corrected in the current action.

Applicant's arguments, on pg. 6 with respect to the 35 USC 112 2nd rejection of claim 46 have been fully considered and are persuasive. Accordingly the rejection has been withdrawn.

Applicant's arguments on pg. 6 with respect to the 35 USC 112 2nd rejection of claim 4 have been fully considered but they are not persuasive.

In the second paragraph on pg. 6, Applicant states:

> Claim 4 has not been amended since it satisfies §112, second paragraph.

In the absence of any evidence or further argument, Examiner cannot withdraw the rejection.

Applicant's arguments, on pg. 6 with respect to the 35 USC 101 rejections of claims 44-48 have been fully considered and are persuasive. Accordingly the rejections have been withdrawn.

Applicant's arguments on pp. 7-10 with respect to the 35 USC 103(a) rejection of claims 1-8 and 33-48 have been fully considered but they are not persuasive.

In the last paragraph on pg. 7 Applicant states:

> None of the art of record discloses conditional creation of a table. Claim 1 recites "creating a fault to target translation table of the null pointer condition check if the null pointer condition check infrequently encounters null pointer conditions." None of the references relied upon by the Examiner, standing alone or in combination, disclose or suggest creation of a fault to target translation table of the null pointer condition check being contingent upon frequency of the null pointer condition check encountering null pointer conditions. In fact, Schilling specifically states that "the table-driven approach consists of building logically read-only, static tables at compile and link time ..." there is no disclosure or suggestion in any of the art of record to create a fault to target translation table for a null pointer condition check if the check infrequently encounters null point conditions.

Examiner respectfully disagrees. The test for obviousness is not that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Benitez teaches determining which control flow paths to optimize (Abstract 'designation typically reduces unnecessary ... optimizations'); Kawahito discloses optimizing null pointer condition checks by removing them and raising an exception instead (pg. 139, col. 1, par. 3 'throw an exception to the application, and thus no explicit instruction has to be generated to check the null pointer') and Schilling discloses that 'fault to target tables are a common way to implement exception handling (pg. 40, sec. 1, 'the commonly known table-driven approach').

It would have been obvious to a person of ordinary skill in the art at the time of the invention to use the teachings of Benitez to determine when and where to perform the optimization taught in Kawahito using the common method indicated in Schilling, thus creating Schilling's table based on Benitez's conditions.

In the first paragraph on pg. 8 Applicant states:

> The rationale proffered by the Examiner for this combination of pieces from various references is optimization. The Examiner begins by proclaiming the obviousness of using the exception handling table of Schilling to handle the zero page exceptions disclosed in Kawahito. Then the Examiner manipulates Benitez to conjure a non-null pointer trace. The Court in Ruiz v. A.B. Chance Co. ...

The findings in Ruiz v A.B. Chance Co. are not applicable here. Examiner has provided supporting reasons why one of ordinary skill in the art would make the suggested combination (see the discussion above and of record), and did not simply reject 'the component parts'.

In the paragraph bridging pp. 8-9 Applicant states:

> As stated in the previous response, Benitez may be used to determine that a null pointer condition check is executed 1000 times, but does not indicate how many of those executions encountered a null condition. In response, the Examiner states that Benitez would "be used to monitor the path taken as a result of the null pointer condition check... and that this would provide an indication of the frequency of null pointer conditions." Applicant requests for the Examiner to identify support in Benitez for the Examiner's statement.

Below are citations from Benitez, which support Examiner's statement.

> '*Control Path* Evaluating Trace Designator' (Title)
>
> 'The present invention is a system, method, and product for continuous *path evaluation*' (col. 2, lines 35-37)

> 'a *control-path* evaluating trace designator is disclosed' (col. 2, lines 37-39)
>
> 'A trace typically is made up of one or more blocks of original instructions of an executable file, each of which may be reached through a common control path. A block is made up of one or more basic blocks. A basic block typically is *a sequence of instructions of an executable file such that there is only one entrance into the basic block and such entrance is the first instruction in the sequence*' (col. 2, lines 53-59)

As can be seen, Benitez monitors *control flow* and not simply the number of times a particular instruction is executed in isolation. One of ordinary skill in the art would have recognized that monitoring control flow would require determining the number of times the various paths of execution had been executed as a result of a conditional instruction, and not simply the number of times that conditional was executed.

In the first full paragraph on pg. 9, Applicant states:

> Furthermore, the Office does not even attempt to indicate disclosure or suggestion of the other limitations of claim 2.

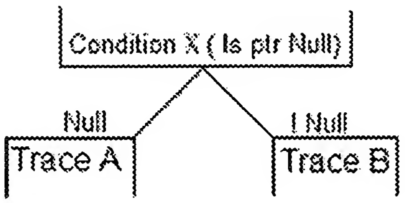
Respectfully, Applicant's arguments amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references. It is unclear from Applicant's statement exactly which limitations are alleged to be untaught. As was indicated in the rejection Benitez teaches gathering, determining, and optimization steps, and combination with the other references directs these steps toward null pointer condition checks.

In the paragraph bridging pp. 9 and 10, Applicant states:

> To reject claims 33-48, the Office goes further and proclaims that Benitez inherently "discloses optimizing code when a complimentary condition occurs less frequently than the given threshold." Hence, to reject claims 33-48, the Office contorts

> Benitez's disclosure of a hot trace identifier that identifies blocks that execute more than a given threshold into a hot trace identifier that monitors the frequency that a null pointer condition check encounters null pointer conditions, regardless of the complete absence of any support for such contortion, and the relies on a unsupported assertion of inherency. "The fact that a certain result or characteristic **may** occur or be present in the prior art is not sufficient to establish the inherency of the result or characteristic MPEP 2122(IV), citing In re Rijckaert, 9 G.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)(emphasis in original). Applicant requests that the Examiner identify support for the assertion of inherency, especially in light of Benitez's disclosure that "[I]f control flow has changed during execution, such that the amount of rate of control flow through a hot trace falls below a threshold value, the trace may be removed" (Abstract).

Please see the Figure and accompanying explanation below.



If we know that 'Condition X' is executed 1000 times, and 'Trace B' is executed 900 times, it is a simple matter to determine that 'Trace A' is executed 1000-900=100 times. This concept represents elementary algebra and is well within the grasp of one of ordinary skill in the software arts. Examiner points Applicant to *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981) "The test for obviousness is not that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art."

Because raising exceptions can be computationally expensive (Schilling pg. 41, Sec 3. 'exceptions can take a longer time to process') as can be implementing an optimization (Benitez Abstract 'reduces unnecessary ... optimizations, and thereby increases execution speed'), one of ordinary skill in the art would have been motivated to use the teachings of Benitez (col. 2, selecting sequences of instructions ... that are most amenable to dynamic optimization') to determine where and when to apply the optimization taught in Kawahito (pg. 139, col. 1, par. 3).

For these reasons and those of record, the rejections of claims 1-8 and 33-48 are maintained.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The amendments to claims 1 and 45 and Applicant's arguments regarding claim 46 are sufficient to overcome the 25, USC 112 2nd rejections of the claims which are consequently withdrawn.

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim recites 'passing fault to target translation data from the fault to target translation table to the compiler using a handler program'. There is no disclosure as to what data is being passed, or when and why it is being passed, therefore it is unclear what the sited claims encompass.

Because of the similarity between claim 4 and original claim 3, claim 4 will be treated as reciting the same limitations as amended claim 3 for the purposes of this action.

Claim Rejections - 35 USC § 101

Applicant's arguments were sufficient to overcome the rejection to claims 44-48, which are consequently withdraw.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over 'Optimizing Away C++ Exception Handling' by Schilling (Schilling) in view of 'Effective Null Pointer Check Elimination Utilizing Hardware Trap' by Kawahito et al. (Kawahito) and further in view of US 6,189,141 to Benitez et al. (Benitez).

Regarding Claim 1: Schilling discloses creating a fault to target translation table (pg. 40, col. 1, par. 5 'building ... tables'), relating the fault condition to a procedural instruction in the fault to target translation table (pg. 40, col. 1, par. 5 'that relate ranges of instruction counter values to ... exception handling'); and compiling the source program to an executable program (pg. 40, col. 1, par. 5 'at compile and link time').

Schilling does not explicitly disclose the fault table handling null pointer conditions, but instead Schilling discloses handling exceptions in general (pg. 40, col. 1, par. 5 'exception handling').

Kawahito teaches eliminating explicit Null Pointer tests (pg. 139, col. 1, par. 3 'no explicit instruction has to be generated to check the null pointer') through use of the Null Pointer Exception (pg. 139, col. 1, par. 3 'accessing the zero address will throw an exception') in an analogous art for the purpose of optimizing the execution of a program (pg. 139, col. 2, par. 6 'converted to hardware traps ... to minimize the execution cost').

Neither Schilling nor Kawahito disclose creating the fault to target translation table on the condition the null pointer condition check infrequently encounters null pointer conditions.

Benitez teaches gathering statistics as to the number of times a path is executed and determining, based on said gathering, when to optimize that path (col. 29, lines 31-33 'if control passes through an arc ... a number of times that is equal to a start-trace threshold, hot trace selector is invoked to select a hot trace'), in an analogous art for the purpose of providing dynamic optimization (col. 32, lines 26-27 'dynamically optimizes hot trace').

It would have been obvious to a person of ordinary skill in the art at the time of the invention to populate the exception table disclosed in Schilling (pg. 40, col. 1, par. 5 'building ... tables') with the null pointer exceptions disclosed in Kawahito (pg. 139, col. 1, par. 3 'accessing the zero address will throw an exception'), because one of ordinary skill in the art would have been motivated to handle exceptions thrown by null pointer references thereby providing program optimization (pg. 139, col. 2, par. 6 'converted to hardware traps ... to minimize the execution cost').

Further, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use Benitez's hot trace designation (col. 29, lines 31-33 'hot trace selector') to only implement the null pointer test elimination taught by Kawahito (pg. 139, col. 2, par. 6 'converted to hardware traps') when the null pointer condition was infrequent, as determined by a frequent execution of the non-null pointer trace (Benitez col. 29, lines 31-34 'if control passes through an arc of a current hot block a number of times ... select a hot trace'), because one of ordinary skill in the art would have been motivated to apply the optimizations where they would do the most good (Benitez col. 2, lines 28-31 'selecting sequences ... that are most amenable to dynamic optimization').

Regarding Claim 2: The rejection of claim 1 is incorporated, respectively; further, Schilling and Kawahito do not disclose gathering statistics regarding, and determining an acceptable rate of, occurrences of the infrequent null pointer condition. However Kawahito does disclose his techniques as being applicable to a dynamically compiled language, namely JAVA™ (pg. 139, col. 1, par. 1 'a new algorithm ... written in JAVA™').

Benitez teaches gathering statistics as to the number of times a path is executed and determining, based on said gathering, when to optimize that path (col. 29, lines 31-33 'if control passes through an arc ... a number of times that is equal to a start-trace threshold, hot trace selector is invoked to select a hot trace'), in an analogous art for the purpose of providing dynamic optimization (col. 32, lines 26-27 'dynamically optimizes hot trace').

It would have been obvious to a person of ordinary skill in the art at the time of the invention to use Benitez's hot trace designation (col. 29, lines 31-33 'hot trace selector') to only implement the null pointer test elimination taught by Kawahito (pg. 139, col. 2, par. 6 'converted to hardware traps') when the null pointer condition was infrequent, as determined by a frequent execution of the non-null pointer trace (Benitez col. 29, lines 31-34 'if control passes through an arc of a current hot block a number of times ... select a hot trace'), because one of ordinary skill in the art would have been motivated to apply the optimizations where they would do the most good (Benitez col. 2, lines 28-31 'selecting sequences ... that are most amenable to dynamic optimization').

Regarding Claim 3: The rejection of claim 1, is incorporated; further, Schilling discloses responsive to a fault that corresponds to a null pointer condition, passing fault to target translation data from the fault to target translation table to the compiler (pg. 40, col. 1 par. 5 'if an exception is thrown ... looks up the current instruction counter in the tables') using a handler program to direct the fault to a target indicated by the fault to target translation data (pg. 40, col. 1 par. 5 C++ runtime system ... give control to a catch handler').

Regarding Claim 4: The rejection of claim 2, is incorporated; further, Schilling discloses responsive to a fault that corresponds to a null pointer condition, passing fault to target translation data from the fault to target translation table to the compiler (pg. 40, col. 1 par. 5 'if an exception is thrown ... looks up the current instruction counter in the tables') using a handler program to direct the fault to a target indicated by the fault to target translation data (pg. 40, col. 1 par. 5 C++ runtime system ... give control to a catch handler').

Regarding Claims 5, 7: The rejection of claims 1, and 3 are incorporated respectively; further Schilling discloses accessing the fault to target translation table (pg. 40, col. 1, par. 5 'building ... tables') during compiling of the source program (pg. 40, col. 1, par. 5 'at compile and link time').

Regarding Claims 6, 8: The rejection of claims 2, and 4 are incorporated respectively; further Schilling discloses accessing the fault to target translation table (pg. 40, col. 1, par. 5 'building ... tables') during compiling of the source program (pg. 40, col. 1, par. 5 'at compile and link time').

Claims 33-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,189,141 to Benitez et al. (Benitez) in view of 'Effective Null Pointer Check Elimination Utilizing Hardware Trap' by Kawahito et al. (Kawahito) and further in view of 'Optimizing Away C++ Exception Handling' by Schilling (Schilling).

Regarding Claim 33, 41, and 44: Benitez discloses optimizing code according to profile feedback for the code (col. 31, lines 57-59 'optimizes hot traces that have been selected by selector 204') that indicates a condition occurs more frequently than a given threshold (col. 29, lines 31-34 'if control passes through an arc ... a number of times that is equal to ... threshold') and thus, inherently, discloses optimizing code when a complimentary condition occurs less frequently than the given threshold. However

Benitez does not place any limits on the type of optimization applied to the code, instead disclosing use of 'any of a variety of known techniques' (col. 32, line 26). Kawahito teaches a program code optimization technique (pg. 139, col. 2, par. 4 'our optimization') which includes eliminating from code, null pointer condition checks (pg. 139, col. 2, par. 5 'null checks ... are converted to hardware traps'). Kawahito teaches the use of exception handling (pg. 139, col. 2, par. 5 'hardware traps') but does not provide any explicit implementation details regarding said exception handling. Schilling teaches a method of exception handling including installing exception entries in a table (pg. 40, col. 1, par. 5 'building ... tables'), wherein the installed entries are utilized to direct execution of the code to respective limits of the code that handle the associated exception (pg. 40, col. 1, par. 5 'that relate ranges of instruction counter values to ... exception handling').

It would have been obvious to a person of ordinary skill in the art at the time of the invention to implement a profile based optimization method (col. 31, lines 57-59), as disclosed in Benitez, using the specific null-pointer check optimization taught in Kawahito (pg. 139, col. 2, par. 5), supported by the exception handling taught in Schilling (pg. 40, col. 1, par. 5) because one of ordinary skill in the art would have been motivated to minimize execution costs (Kawahito pg. 139, col. 1, par. 1 'in order to minimize the execution cost') of a dynamically translated program (pg. 139, col. 2, par. 5) by only applying the null-pointer optimization to where it is most needed (Benitez, Abstract 'reduces unnecessary translations and optimizations, and thereby increases execution speed').

Regarding Claim 34: The rejection of claim 22 is incorporated; further Benitez discloses identifying conditions that are encountered more frequently than the given threshold (col. 29, lines 31-34 'if control passes through an arc ... a number of times that is equal to ... threshold') and thus, inherently, discloses identifying conditions when a complimentary condition occurs less frequently than the given threshold.

Regarding Claim 35, 43, 48: The rejection of claim 33 is incorporated; further Benitez discloses extracting information about condition frequencies from the profile feedback for the code (col. 29, lines 31-34 'if control passes through an arc ... a number of times that is equal to ... threshold').

Regarding Claim 36: The rejection of claim 35 is incorporated; further Benitez discloses determining those of the condition checks that have profile feedback information that indicates the condition occurs more frequently than the given threshold (col. 29, lines 31-34 'if control passes through an arc ... a number of times that is equal to ... threshold') and thus, inherently, discloses determining those of the condition checks that have profile feedback information that indicates the complimentary condition occurs less frequently than the given threshold.

Regarding Claim 37, 47: The rejection of claim 33 is incorporated; further Benitez discloses generating executable code from the optimized code (col. 31, lines 57-59 'dynamically translates').

Regarding Claim 38, 42 and 45: The rejection of claim 33 is incorporated; further Schilling teaches generating the table to associate faults with respective exception handling code units (pg. 40, col. 1, par. 5 'that relate ranges of instruction counter values to ... exception handling').

Regarding Claim 39, 46: The rejection of claim 38 is incorporated; further Schilling teaches populating the table with instruction identifiers of instructions associated with the exception conditions and respective ones of the exception handling code units (pg. 40, col. 1, par. 5 'that relate ranges of instruction counter values to ... exception handling').

Regarding Claim 40: The rejection of claim 39 is incorporated; further Schilling discloses the table indicating instruction identifiers for instructions that cause faults and identifiers for the handling code units (pg. 40, col. 1, par. 5 'that relate ranges of instruction counter values to ... exception handling').

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Mitchell whose telephone number is (571) 272-3728. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jason Mitchell
11/10/05

TODD INGBERG
PRIMARY EXAMINER